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# ELECTROSURGERY

WITH THE
BIRTCHER
SURGICAL UNIT

American
Medical
Assn.
Accepted
Council on Physical Therapy

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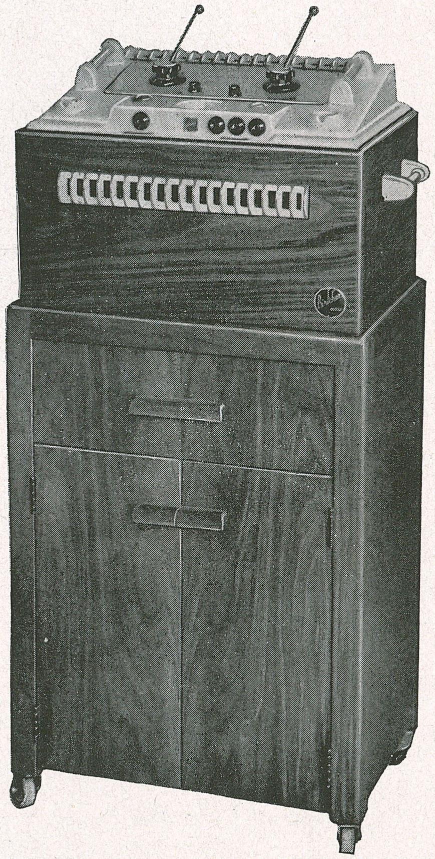
# *Birtcher*
# ELECTRO-SURGICAL UNIT

**A Tube Circuit for Cutting**

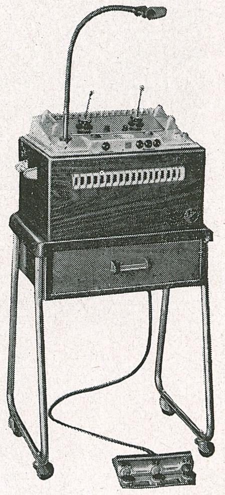
**A Spark-Gap Circuit for Coagulation**

*The Simultaneous Use of Both*



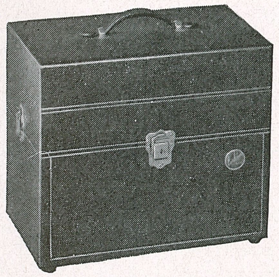
**CATALOG NO. 799-O**

● Birtcher Electro-Surgical unit, Office Model, in solid walnut case, mounted on No. 961 Sub-Cabinet.

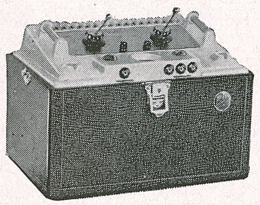


● The Office Model is shown above on Mobile Table No. 501-K, with adjustable Electrode Holder No. 798 mounted on panel.

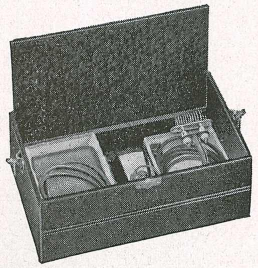
## FOR ALL MAJOR AND MINOR TECHNIQUES OF ELECTRO-SURGERY, INCLUDING TRANS-URETHRAL PROSTATIC RESECTION AND MONOTERMINAL BLADDER FULGURATION



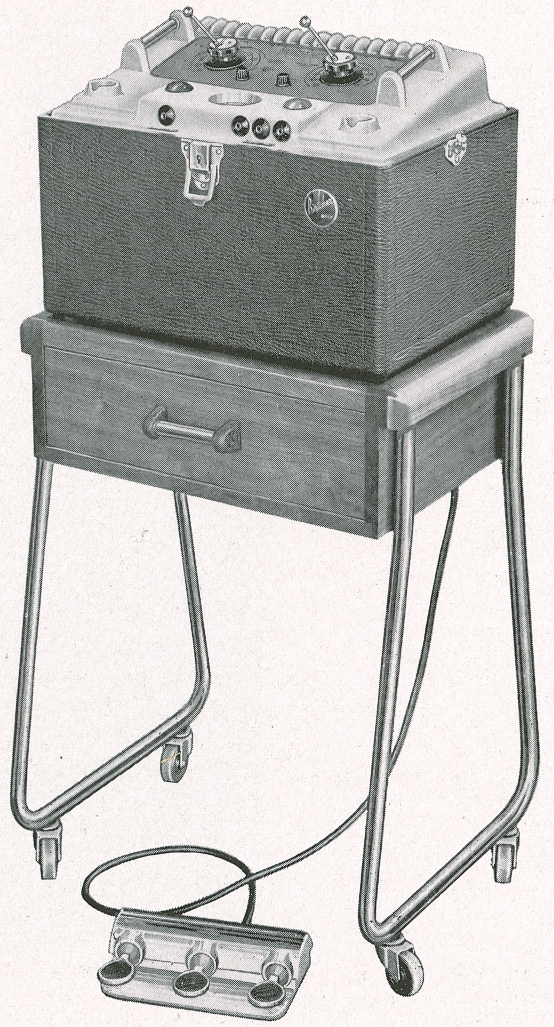
● The Birtcher Electro-Surgical unit is also available as a very convenient portable unit, mounted in a black keratol-covered case, which can be locked with the key provided.



● The Portable Model includes the same equipment as the Office Model.



● The portable case of the No. 799 Electro-Surgical unit provides a convenient accessory compartment in the removable lid.



Birtcher Electro-Surgical Unit, Portable Model, mounted on No. 501-K Mobile Table.

**GUARANTEED FOR TWO YEARS**

Birtcher

# OPERATING INSTRUCTIONS

# "Birtcher-Built"

# ELECTRO-SURGICAL UNIT

## CHECKING SHIPMENT

UPON receiving the Unit, examine packing crate for external damage. If none, unpack machine and examine for any damage which may have occurred in shipment. If there is any damage, please call in the local representative of the freight or express company who handled the shipment, and file damage claim on form he will provide—then report the damage in a letter to the dealer who made the shipment, or direct to the Birtcher Corporation, 5087 Huntington Drive, Los Angeles 32, California.

## ACCESSORIES

Standard equipment with the Birtcher Surgical Unit includes:

One 3-pedal, current selection switch.

One line cord.

One No. 795B Electro-Surgical set, with Boilable handle and 5 assorted loops and blades.

One metal mesh, sponge rubber backed indifferent electrode with connecting cord.

One special active cord for connecting machine to terminal of operating cystoscopes.

Two chromium-plated steel rods for insertion into control dials of machine, to permit advance sterilization of control parts.

Two tubes (United, Type CV11).

NOTE: The surgical unit is shipped with the tubes mounted in their respective sockets. The tube sockets are suspended in spring mountings which absorb all shock and make possible the shipment of the machine with tubes in place without risk of tube damage.

NOTE: The No. 798 Adjustable Electrode Holder, a boilable arm designed for quick fitting to the machine and for convenient holding of the active surgical handles near the operator, is not standard with the unit, but is furnished on order at a moderate price.

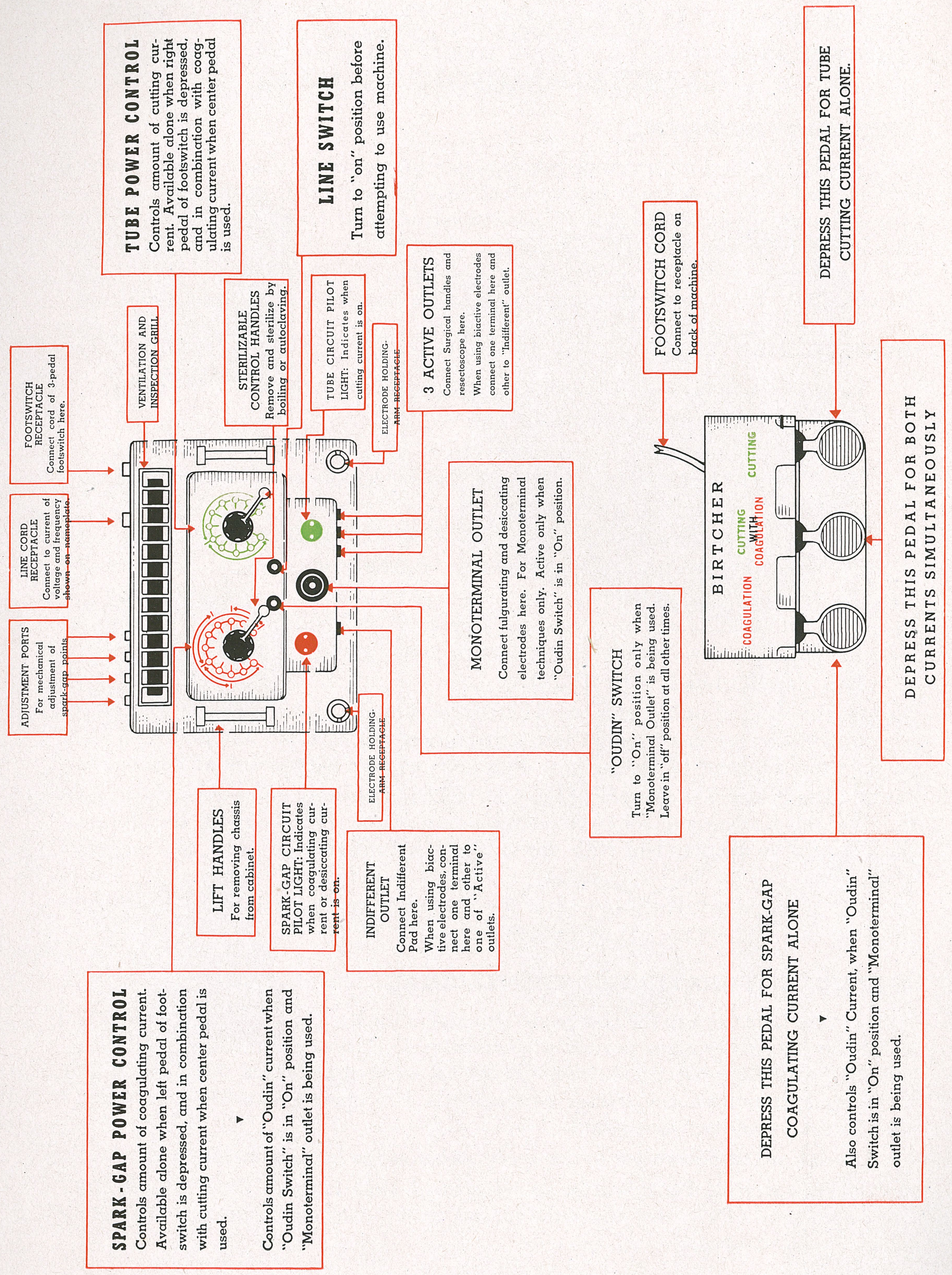
NOTE: Either the 799 Portable unit or the 799-O Walnut case model will fit either the 501K Mobile table or the 961 Walnut sub-cabinet.

## PHYSICAL OPERATION OF THE MACHINE (See chart page 4)

ATTACH the Line Cord to the two-prong terminal at the back of the machine. Line Cord should be attached to a line providing 50- or 60-cycle, 110-volt alternating current, unless the name plate states otherwise. On special order the Surgical Unit can be provided for operation on any voltage or frequency. For operation on direct current, a special rotary converter is required.

Attach Cord of Footswitch to the 3-way socket at the back of the machine.

On the operating Panel will be found a small knob labeled "TUBE FILAMENTS." Turn this knob "ON"—this places the current in the machine, lights and warms the filaments of the tubes.



**TUBE POWER CONTROL**
Controls amount of cutting current. Available alone when right pedal of footswitch is depressed, and in combination with coagulating current when center pedal is used.

**LINE SWITCH**
Turn to "on" position before attempting to use machine.

FOOTSWITCH RECEPTACLE
Connect cord of 3-pedal footswitch here.

VENTILATION AND INSPECTION GRILL

STERILIZABLE CONTROL HANDLES
Remove and sterilize by boiling or autoclaving.

TUBE CIRCUIT PILOT LIGHT: Indicates when cutting current is on.

ELECTRODE HOLDING-ARM RECEPTACLE

3 ACTIVE OUTLETS
Connect Surgical handles and resectoscope here.
When using biactive electrodes connect one terminal here and other to "Indifferent" outlet.

LINE CORD RECEPTACLE
Connect to current of voltage and frequency shown on nameplate.

ADJUSTMENT PORTS
For mechanical adjustment of spark-gap points.

MONOTERMINAL OUTLET
Connect fulgurating and desiccating electrodes here. For Monoterminal techniques only. Active only when "Oudin Switch" is in "On" position.

LIFT HANDLES
For removing chassis from cabinet.

SPARK-GAP CIRCUIT PILOT LIGHT: Indicates when coagulating current or desiccating current is on.

ELECTRODE HOLDING-ARM RECEPTACLE

INDIFFERENT OUTLET
Connect Indifferent Pad here.
When using biactive electrodes, connect one terminal here and other to one of "Active" outlets.

**SPARK-GAP POWER CONTROL**
Controls amount of coagulating current. Available alone when left pedal of footswitch is depressed, and in combination with cutting current when center pedal is used.
▼
Controls amount of "Oudin" current when "Oudin Switch" is in "On" position and "Monoterminal" outlet is being used.

"OUDIN" SWITCH
Turn to "On" position only when "Monoterminal Outlet" is being used. Leave in "off" position at all other times.

FOOTSWITCH CORD
Connect to receptacle on back of machine.

DEPRESS THIS PEDAL FOR TUBE CUTTING CURRENT ALONE.

DEPRESS THIS PEDAL FOR BOTH CURRENTS SIMULTANEOUSLY

DEPRESS THIS PEDAL FOR SPARK-GAP COAGULATING CURRENT ALONE
▼
Also controls "Oudin" Current, when "Oudin" Switch is in "On" position and "Monoterminal" outlet is being used.

## SIGNAL SYSTEM *(color)*

When the pedal at right is depressed, the green pilot light flashes on the operating panel indicating the flow of the tube cutting current. When the pedal at left is depressed the red pilot light flashes on the panel indicating the flow of the spark-gap coagulating current. When the center pedal is depressed, both the red and green pilot lights flash, indicating the flow of *both currents simultaneously.*

## SIGNAL SYSTEM *(sound)*

When the spark gap circuit is in operation it is apparent to the operator by the sizzling sound of the spark gaps. The tube circuit is ordinarily noiseless, so in order that the operator may know which current is on by sound alone, a high pitch hum signal has been wired into the tube circuit.

## POWER

The Birtcher Surgical Unit is really two complete and different machines built into one case. As one stands in front of it, looking at the Operating Panel, the left hand side of the unit with the dial indicated in red, and with the red pilot light, is the spark gap section of the machine, and the right hand side of the unit with the dial indicated in green, and with the green pilot light, is the tube section of the machine.

When the red-marked left hand footswitch pedal is depressed, the damped high-frequency coagulation current comes from the left side of the machine. The red dial provides the settings of control for the strength of the *coagulation* current.

When the green-marked right hand footswitch pedal is depressed, the undamped high-frequency cutting current from the power tubes comes from the right hand side of the machine. The green dial provides the settings of control for the strength of the *cutting* current.

The amount of power, obtainable from either the spark-gap circuit or the tube circuit, is directly related to the setting of the pointer of the respective control knob. The higher numerically the setting, the greater the power. However . . . each control is independent of the other. The cutting control may be advanced to a high and powerful current with the spark-gap coagulation control at a relatively low position or vice versa.

## SUGGESTED CONTROL DIAL SETTINGS

As a suggestion to proper settings for different types of operative procedures, the dials are carefully labeled. These are only suggestions, however, and the operator may set the dials according to his own liking regardless of whether above or below those suggested.

It is suggested that in cutting in a relatively dry field, the green Power Control Dial of the tube circuit be set at some position between the numbers "1" and "5."

In under water cutting, as required in Trans-Urethral Prostatic Resection, or in dissecting within a cavity filled with blood or fluids, the Tube Power Control Dial should be set from "6" to "11."

When doing Electro-Coagulation, a setting from "5" to "11" on the Red Dial is recommended, using a higher numerical setting when coagulation is required under water or in an excessively wet field.

It is recommended that the Gap Power Control Dial be set at some position between "3" and "8" when employing Bi-Active Double Needle Electrodes, such as the Wilimac Calibrated Dosage Cervical and Tonsil Electrodes, the Cherry Cervix Electrode, the Haiman Bi-Active Electrode.

When using the Monoterminal "Oudin" Current with a single needle, it is recommended that the Gap Control be set at from "1" to "3" when desiccating a small growth such as a wart or mole in a dry field, or from "9" to "11" when fulgurating under water, as in *Bladder Fulguration.*

## ATTACHMENT OF INDIFFERENT ELECTRODES

In all Electro-Surgical cutting technics, and in all Electro-Coagulation technics (excepting when using double needle Bi-ActiveElectrodes) an Indifferent metal Electrode must be connected to the terminal on the front of the machine labeled "INDIFFERENT," and this metal electrode placed directly against the patient's skin. The Indifferent Electrode should be the one provided with the Birtcher Surgical Unit, or an ordinary piece of block tin, such as is used as material for electrodes with diathermy equipment, may be used. The indifferent electrode should measure at least 6 x 8 inches.

Always place the indifferent electrode in smooth firm contact with the skin, relatively close to the operating field. It is usually placed under the patient immediately below the operating field . . . the patient's weight holding the Indifferent Electrode in firm contact.

## ATTACHMENT OF ACTIVE ELECTRODES

In front of the machine there are three terminals labeled "ACTIVE." One may attach the cord leading to the Surgical Handle or to the McCarthy Electrotome (when doing Trans-Urethral Prostatic Resection to any one of the three terminals.

Three terminals are provided so that three Active Handles, each holding a different type of loop or blade, may be connected to the machine at one and the same time. If three Surgical Handles are attached at one and the same time, the No. 798 Adjustable Electrode Holder should be used with the machine. The Holder plugs into the sockets provided on each side of the operating panel and readily holds the Electrodes where they are quickly interchangeable to the operating surgeon.

## STERILIZABLE HANDLES

Each machine is equipped with two chromium control rods which fit into the Power Control Dials. These chromium rods may be sterilized by boiling or autoclaving and thus the sterile operator may adjust the dials during the course of a surgical operation. Some operators find it convenient to move the Dials by nudging the Control rods with the elbow.

## MONOTERMINAL "OUDIN" CURRENT

Between the two pilot lights is a single outlet labeled "MONOTERMINAL." The current provided here is one of high voltage and high frequency, from the spark-gap circuit, and requires that one step on the left pedal of the footswitch only to procure energy from it for single needle desiccation and fulguration. The Gap Power Control Dial regulates the amount of energy available. The knob on the operating panel labeled "OUDIN" *must be left* in the OFF position at all times EXCEPT when using the monoterminal "Oudin" current. This switch has been provided to shield out any current whatsoever from the high voltage "Oudin" Terminal when using the machine for all other purposes. Turn "Oudin" knob rightward to "on" position when using monoterminal outlet.

## BLENDING THE SURGICAL CURRENTS

One of the prime features of the Birtcher Electro-Surgical Unit is the ability to have both the tube-cutting current and the spark-gap coagulating current over the patient operating circuit simultaneously, blending the two currents in just the right proportions to suit the requirements of the operator. This is achieved by the operator placing his toe on the center pedal of the footswitch.

Inasmuch as on the operating panel the setting of each Power Dial is independent of the other, the operator will quickly learn the relative positions to place each Dial to achieve just the right amount of coagulation in proportion to his speed of cutting, which is most suitable for the type of surgery he is performing.

## HEAVY COAGULATION WITH VERY LARGE BALL POINTS OR BUTTON-SHAPED ELECTRODES UP TO ½ INCH OR MORE

In some requirements of Electro-Coagulation, in which it is desirable to destroy a massive area to a considerable depth, and in which the operator uses a ball point as the Active Electrode, or perhaps even a flat Disc Electrode up to ½ inch or more in diameter—should the total power on the spark-gap circuit be insufficiently fast for his purposes, the center pedal of the footswitch may be stepped on and the tube current employed with the spark-gap current to augment the total intensity. Of course, since the tube current in this case is spread over the broad surface of the ball or button electrode, it will in no way tend to cut, but merely increase the total intensity of coagulation.

## INSPECTION OF INSIDE OF MACHINE

The occasion for any adjustment inside the machine will be exceedingly rare, however, to remove the entire machine from the case, turn the Unit on its side and with a screwdriver remove the two screw-head bolts which appear on the bottom of the case. Now merely grasp the two handles on the operating panel and lift the entire machine out of the case. The Unit is designed with the entire assemblage mounted on a steel chassis suspended from the one-piece cast aluminum panel so that it is readily accessible for servicing.

## ADJUSTMENT OF SPARK GAPS

In heavy-duty service in which the Unit is employed for major Electro-Surgery as often as five or six times a week, the Spark Gaps should be adjusted once every six months. Any time that the sound of the Spark Gaps seems erratic it is an indication that the Gaps need adjustment.

To adjust Gaps, select a long wooden-handeled screwdriver, insert it in the holes provided in the back of the machine, to each of the four Gaps. Step on footswitch and turn screw-head of Gap axis clockwise to bring opposing points of Gaps closer together. While depressing the spark-gap circuit footswitch pedal, observe the gaps by looking through the grille on top of operating panel. Opposing points of spark-gaps should be adjusted to .005 (five one-thouandths) inch between them. If no measurement gauge is handy, try putting a strip of paper through the opening between the opposing points. The cover of this booklet is five and one-half thousandths thick, so it would not quite go through. In heavy-duty service, in which the machine is used for major surgery in the hospital a dozen or so times per week, it is desirable to gently clean the surface of the spark-gap points with a strip of emery paper and reset the points for distance about once every three months.

## TUBES

The Unit uses type CV-11 Power Tubes, manufactured by the United Electronics Company, Newark, New Jersey. A pair should give several years of service in ordinary usage. Failure of the cutting current of the machine suggests immediate examination of the tubes. If a tube fails to light, or has turned milky-white on the inside of the glass, it is an indication that the tube needs replacing.

## DO'S AND DON'TS

1. Be sure that the small knob on the Operating Panel, labeled "Oudin" is in the "Off" position when employing this machine for any purpose, excepting when using a single needle attached to the monoterminal connection between the two pilot lights.

2. Be sure that this machine is attached to 110-volt, 50- or 60-cycle, alternating current supply source, unless it has been specifically prepared at the factory for operation on current of other voltage and cycle, which will be indicated on the name plate on the back of the machine.

3. Don't expect to enjoy successful Electro-Surgery without familiarity with both the operation of the machine and Electro-Surgery technics. Successful Electro-Surgery requires first—knowledge and ability in conventional surgery and all that it involves plus the added requirements that are unique in employing electricity as the cutting and coagulation agent.

4. Experiment on a piece of beef or on animals until familiar with the operation of this equipment and facility with the agent is gained.

5. In each and every operation, be sure that the metal of the Indifferent Electrode is in firm contact with the skin of the patient. If the patient is hairy, shave the hair. It is recommended to coat the metal surface of the electrode with K-Y Jelly. Be sure that the major portion of an Electrode, measuring at least 6x8 inches, is in contact with the skin. Be sure that no metal portion of the Indifferent Electrode is in contact with the metal operating table. Be sure that electric contacts of cords to machine are snug and that there is no break in the insulation.

6. Use the lowest power that cuts freely to the desired depth in the tissue being sectioned.

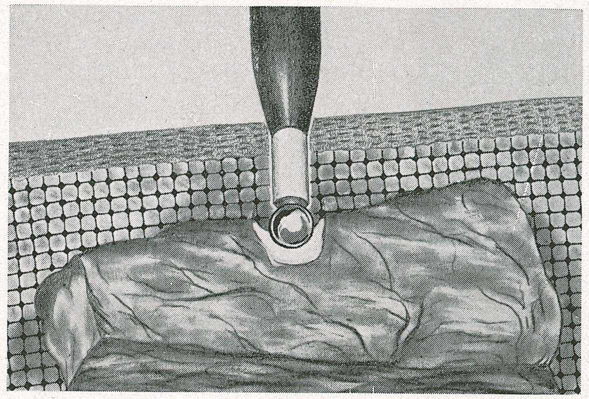
7. Select size and shape of Electrode best fitted for the technic at hand. Do not use Electrodes that are awkward. Keep in mind that hard, dry sclerotic tissue, fat and cartilage, require more power than softer or moisture structures. Also, the faster and deeper the cut, and the larger the Electrode, the more power required.

## CLEANING ELECTRODES

During the course of an operation, particles of coagulated tissue and blood tend to stick to the active operating loop or blade. Electrodes should be kept clean and smooth for best results. The operator should provide himself with some steel or copper wool that has been made sterile so that during the course of an operation his assistant may quickly wipe clean the operating blades and loops. Ordinary woven copper wool pads, inexpensively procured at the five- and ten-cent store and used in the kitchen for cleaning pots and pans, serve the purpose nicely.

## GENERAL PRINCIPLES

When an electric current flows through any substance which offers resistance to its passage, heat is generated. In Electro-Coagulation the current flows between the Active Electrode and the Indifferent Electrode. No heat is generated at the Indifferent Electrode because of the large area of its surface. Since the same volume of current concentrates around the very small surface area of the Active needle or ball point, the resistance of the immediate adjacent tissue is sufficient to create adequate heat to cook the tissue—Electro-Coagulation (see figure 1). A current of an undamped nature, as generated by a tube circuit, will cut the tissue, a true damped current, which is provided by a spark-gap circuit, will bring about coagulation, because it cannot cut.

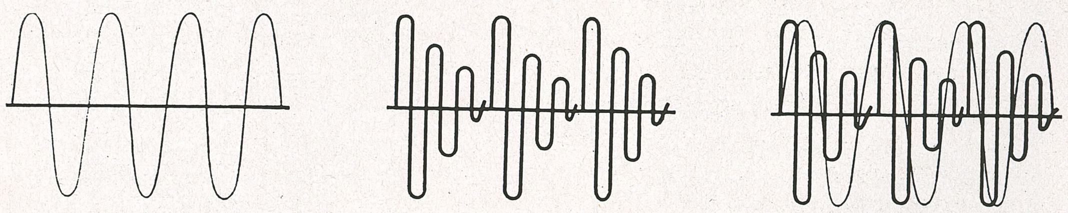


***Note Coagulation Around Ball Point***

**FIGURE 1**

An Electro-Surgical cutting current must be one of undamped oscillations. A true undamped current is provided by a tube circuit and a tube circuit only. A strictly spark-gap circuit can be modified somewhat to imitate a true undamped current and will then cut to a certain degree but by no means with the ease achieved with the true undamped current from a tube circuit. (See figure No. 2 for illustrations of types of currents).

The cutting current is not one which burns its way through tissue like a cautery. The voltage of the undamped current apparently "explodes" the individual cells immediately in front of the guiding blade or loop. Therefore, actually, cutting is achieved with the electrical current merely guided with a dull blade or wire loop.



Dry or wet field cutting with true, undamped (tube generated), current for *maximum* ease of *cutting* with *minimum coagulation.*

Dry or wet field coagulation with true damped (spark-gap) current for coagulation *without cutting.*

*Simultaneous* cutting and coagulation with *blended,* damped and undamped (tube and gap) *currents.* Intensity of each *independently* controllable.

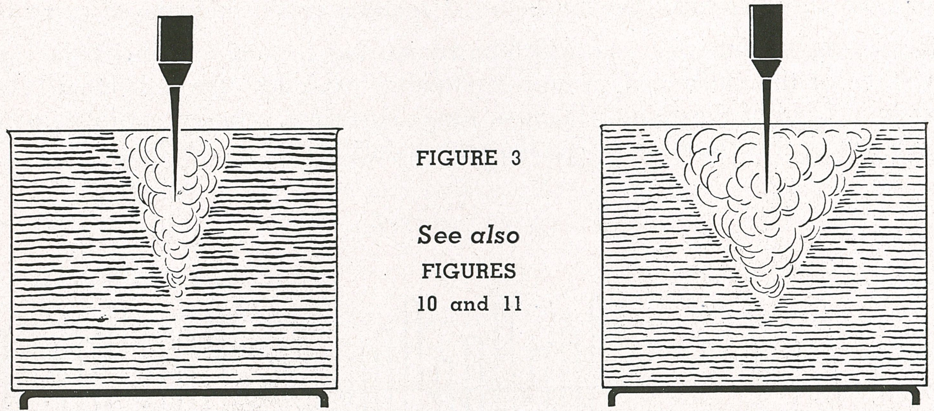
**FIGURE 2**

## SPEED OF CUTTING

Since even when using the strictly undamped cutting current, there is some resistance to the flow of the current and therefore some heat is generated, a small amount of coagulation of immediate adjacent tissue occurs as one cuts the tissue. However, since "time" is a factor in any cooking process and coagulation is a cooking process, the speed of the stroke of the cutting blade or loop, in relationship to the power on, is of importance. A slow stroke, with a relatively small amount of power, will usually coagulate the tissue somewhat greater than a quite quick stroke with a greater amount of power. Experience must be the guiding factor in properly gauging this. In all technics of Electro-Surgical cutting, however, at least some coagulation is desirable in order to shrivel and occlude the ends of the smaller vessels and inhibit bleeding and oozing, achieving what is known as "bloodless cutting," which is a primary advantage of Electro-Cutting over orthodox methods.

## ELECTRO-COAGULATION

In Electro-Coagulation, one merely steps on the left-hand pedal of the footswitch, gaining the damped spark-gap current from the machine. With this true damped current, a needle point, loop, ball point, or blade will coagulate the tissue without any tendency to cut whatsoever. In major surgery, an area to be coagulated may be contacted with the Active Electrode and the current turned on — or the needle point may be actually inserted into the tissue. Coagulation occurs around and slightly beyond the end of the needle point. Experience alone must be the guiding factor as to the depth of coagulation, but it must be kept in mind that a longer "time" factor will bring about greater and deeper coagulation than a greater amount of power for a very short period.



*Coagulation Around Needle with Strong Current Short Time.*

FIGURE 3

*See also* FIGURES 10 and 11

*Extensive Coagulation by Moderate Current Longer Time.*

## ELECTRO-HEMOSTASIS

Electro-Coagulation in major surgery has, in the past few years, proven to be very useful as a means of procuring hemostasis. Operations in which small and fair-sized bleeders are encountered—and in which ordinarily many hemostats or ligatures are required, may be handled using the Coagulation current in many cases. These small bleeders may be seized in the usual manner with the hemostat. The operator or assistant may then hold the hemostat up in such a manner that no portion of it contacts any tissue excepting the actual point which is clamped to the bleeder—then the active blade may be brought in contact with the hemostat, an inch or two above the point, and the current turned on. The current will flow down the hemostat to its point and gently coagulate the walls of the bleeder together (see Fig. 4). Surgeons have reported complete thyroidectomies, hysterectomies, breast amputations, nephrectomies, etc., without the use of ligatures.

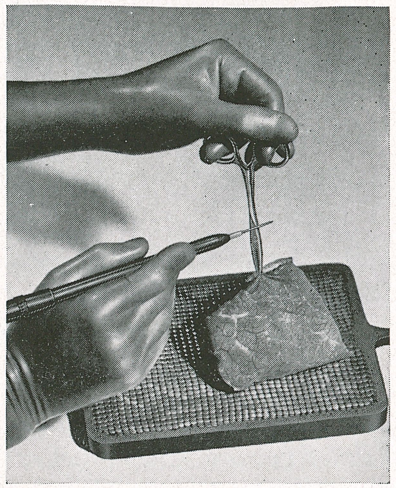


FIGURE 4

Very small vessels which usually do not bleed after the clamp is removed, can be sealed for certain with a mild current.

Moderate-sized vessels which ordinarily bleed after taking off clamp, may be controlled by coagulation through the hemostat, using just enough current and time to slightly blanch the tissue of the vessel. Whereas some surgeons have reported success in coagulating larger vessels, as a general rule, it is recommended that vessels, up to 1/16 inch diameter only be controlled by this method. Conventional ligation should be used on larger vessels.

In employing this method, be sure that the operating field is sponged free of excessive fluids around point of hemostat, otherwise current will be dissipated through fluids.

## COAGULATION WITH BI-ACTIVE ELECTRODES

In recent years there have been developed what are properly known as Bi-Active Needle Electrodes. In this type of Electrode there are two needles and two cords. No Indifferent Electrode is used, but the cord tips of the two cords are attached to the opposite sides of the circuit of the machine—one cord to the Indifferent Outlet, the other to one of the Active Outlets. By this method the current flows between the two needle points and coagulates the tissue between them, slightly around them, and just beyond

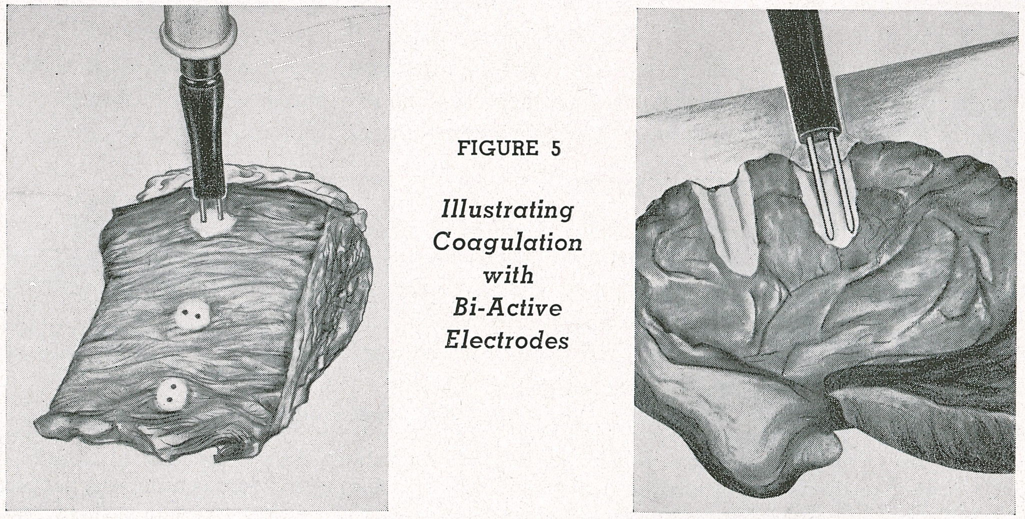
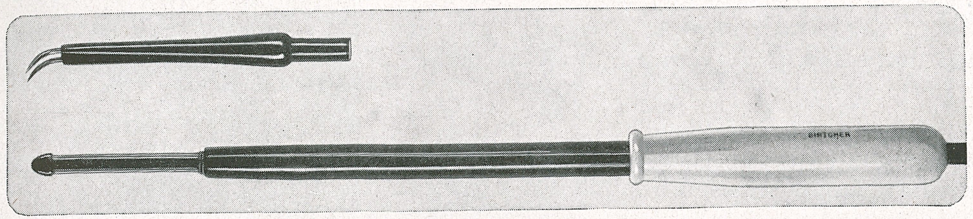


FIGURE 5

*Illustrating Coagulation with Bi-Active Electrodes* the end of the needle points. It is claimed, therefore, by this method that the depth of coagulation is under greater control (see Fig. 5). Special types of Electrodes have been designed along these lines, for Electro-Coagulation of tonsils, turbinates, the cervix, and surface growths, and for the Thorek Gall Bladder Coagulation Technic.



*No. 789 Bi-Active Coagulation Needle Set for Cervix, Tonsils, Surface Growths*

## DESICCATION AND FULGURATION

If a single needle is attached to a high-voltage, high-frequency current, the current will jump from the end of the needle point to any object which has a capacity for electrical current and acts as a ground. When a needle point attached to the monoterminal "Oudin" Outlet on the Birtcher Surgical Unit is brought to within 1/16 of an inch to 1/3 of an inch from tissue, a spark will jump from the needle point to the tissue, bringing about a shallow destruction, this is known as fulguration. If the needle is brought into contact with the tissue, or its point inserted in the tissue, the tissue is destroyed to a somewhat greater depth and this is known as desiccation. Usually these methods are employed for the destruction of smaller growths such as warts, moles, cysts, papilloma, etc. Usually, also, as one desiccates he does some fulgurating, and vice versa. It has been claimed fulguration carbonizes the tissue and desiccation dehydrates it.

In desiccation and fulguration, of course no Indifferent Electrodes or other connection is used. A single cord attached to operating handle holding the needle, is merely attached to the monoterminal outlet on the machine, and the spark-gap control pedal of the footswitch depressed. Urologists have long used this form of current for destruction of various growths within the bladder by employing a special needle through an operating cystoscope. A special cord for attachment of machine to operating cystoscope is standard equipment with each Birtcher Surgical Unit.

## PRELIMINARY EXPERIMENTS

For acquainting the operator with the Birtcher Surgical Unit and the technics which are peculiar to Electro-Surgery, it is recommended that he spend many hours in experimental work on sizeable pieces of beef. If the operator has had no previous experience in Electro-Surgery, it is recommended that he spend some time observing an experienced operator in a hospital, following up with operative work on animals before proceeding cautiously on his first case of major Electro-Surgery.

**NOTE NO. 1:** In doing experimental cutting, coagulation, or desiccation on beef, liver, kidney, etc., be sure that the tissue is first warmed to near human body temperature, in order to duplicate as nearly as possible the current action on human tissue. Meat as ordinarily procured at the market is at a temperature less than 40 degrees F. The action on tissue at this temperature is altogether different than on tissue at 987.6 F. This is particularly true in coagulation and desiccation.

**NOTE NO. 2:** In doing monoterminal desiccation or fulguration experimentally, always hold the beef in the hand or otherwise bring it into firm contact with your body. This is required in order to obtain the effect of "body capacity" as in actual operating work. If a small section of beef is merely placed on a table and contacted with the needle point, the desiccation action will vary greatly from the action of the current in actual surgery.

**NOTE NO. 3:** If the current is turned on with an electrode attached to the high-voltage Monoterminal outlet without the electrode being in contact, or nearly so, with the patient, a spark may come through the insulation of handle or cord, surprising and slightly burning the operator. This is not a weakness in the machine, nor of the insulation of the handle or cord, but is functional in this type of current. Therefore, always put point of operating needle in contact, or nearly so, with tissue *before* depressing footswitch.

## COORDINATION

Use of electrical cutting currents is quite different from orthodox surgical procedures. The operator must accustom himself to controlling the current by use of the footswitch, he must familiarize himself with the "feel" of the cutting blade or loop in the tissue, since there is practically none of the resistance usually associated with the ordinary scalpel. He must coordinate the speed of the cutting, the depth of insertion, the amount of power and the amount of coagulation, as he cuts.

Procure a good two-pound piece of beef, veal, or beef heart. Attach the Indifferent Electrode to the machine, place it on a convenient table, and place the meat on the Electrode. Select meat that is fresh and moist, that has on it some fat, some cartilage, and some facia, in order to experiment in cutting the various types of tissue. Since each type of tissue offers a different electrical resistance and electrical capacity, there are different requirements with each. Even then, in this experimental work, there will be a difference than when operating on the human body due to the difference in moisture content and saline content, and the temperature of the tissue.

With the meat placed on the Indifferent Electrode and the Active Electrode connected to one of the active outlets, one is ready to proceed in experimental incisions. At first, place the straight blade in the surgical handle. Place the tube current Control Dial at Position No. 5 or No. 6.

Now place the tip of the blade in contact with muscle tissue. Then step on the right-hand pedal of the footswitch. Draw the blade through the tissue fairly rapidly, with the point of the blade inserted about a quarter to one-half inch deep. A clean cut will be made with ease. Observe the amount of coagulation that has taken place as you cut.

Now, with the Power Control Dial left in the same position, take another stroke in the tissue but using at least twice as much time to make the same length of stroke. Note the increased coagulation.

Now advance the Power Dial three or four positions and make a very fast stroke with considerable power on. You will observe that cutting has been very rapid with absolute minimum of coagulation. Such a stroke is recommended for an initial incision in the skin when necessary to achieve minimum coagulation in order that healing may take place by first intention.

## CUTTING WITH BLENDED COAGULATION

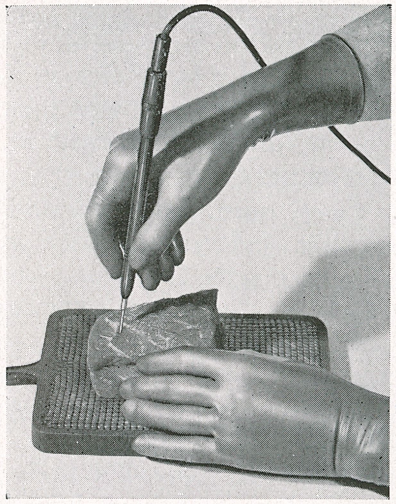
With the Power Dial of the spark-gap circuit set to position 5, 6, or 7, try stepping on the center pedal of the footswitch and repeat the strokes as mentioned above and note the added coagulation.

Now step on the left pedal of the footswitch bringing point of blade and side of blade in contact with tissue and note the coagulation. Experiment here also both with the amount of power and the amount of time.

Seize some of the tissue with a hemostat and contact the hemostat with the blade.

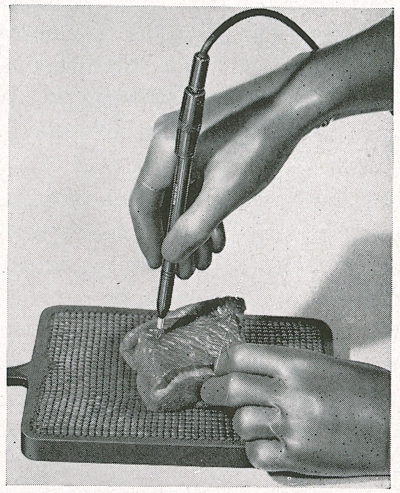
## THE CUTTING STROKE

Since we are cutting with the arc of the current and not with the blade, contact is first made with the point of the blade and not with its edge, as with the ordinary scalpel. Insert the point of the blade to the depth desired, then move it forward in a horizontal motion. See Figures 6, 7, 8, 9.



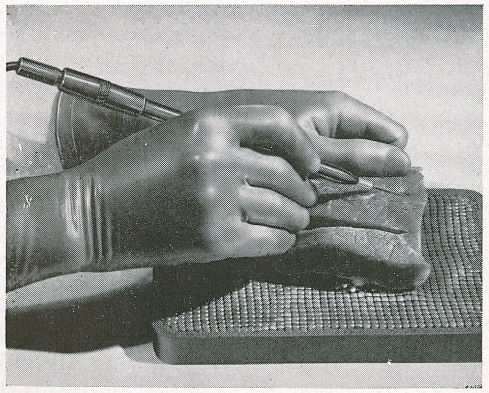
RIGHT

*Fig. 6—Correct Approach with Blade*



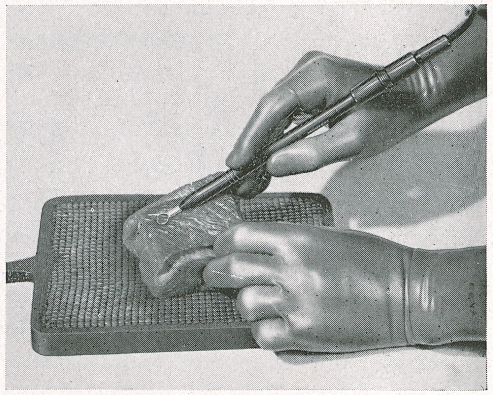
RIGHT

*Fig. 7—Correct Approach with Wire Loop Electrode*



WRONG

*Fig. 8—Wrong Approach with Blade. Cut will not be clean and quick as desirable.*



WRONG

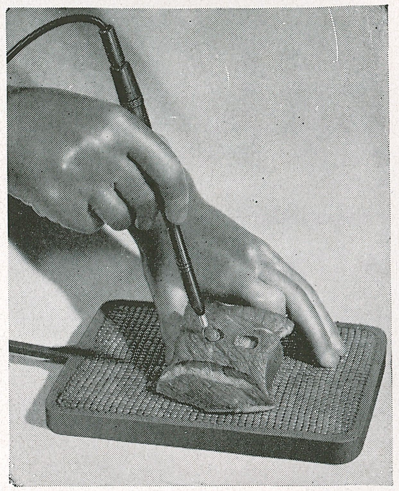
*Fig. 9—Wrong approach. Loop will drag and tissue burned.*

## FOOTSWITCH CONTROL WHEN CUTTING

Some operators prefer to step on the footswitch and have the current on at the time contact with the tissue is established, finishing the stroke with the current still on. This seems to assist in cutting excessively fibrous and tough tissue.

Other operators prefer to contact tissue first, then turn on the cutting current. *Either method may be employed with the Birtcher Surgical Unit, according to the liking of the operator.*

One should experiment also in cutting fat and other types of tissue, using somewhat more power for fat. Fat is the most difficult tissue to cut due to the fact that it does not carry the electric current readily. However, fat cuts more readily in live tissue than in dead tissue.



*"Scalloping" out tissue with loop electrode*

One should then experiment with the other shaped blades, needle points, and loops. While loops of various shapes will be found particularly desirable, for "Scalloping" out pieces of tissue of various sizes and shapes, here too one should experiment using only a portion of the loop at first, then gradually learning to bury most of it in the tissue. Likewise the vertical stroke should be first employed. A fair amount of power is required in cutting with the loops, inasmuch as the circumference of a loop presents a considerable length.

## UNDER-WATER CUTTING AND TRANS-URETHRAL PROSTATIC RESECTION

The ability of an Electro-Surgical Unit to cut under water is essential because of the technic of Trans-Urethral Prostatic Resection in which in order to establish clear vision, water is pumped through the cystoscope continuously.

The Birtcher Surgical Unit will readily cut under water in performance of this technic due to the true undamped nature of the cutting current, which provides the finest known means of under-water cutting.

In under-water cutting it must be borne in mind that fluids carry electrical currents more readily than does tissue. Therefore, in any under-water technic, or in major surgery in which the operating field is filled with blood or other fluids, it is essential that as much of the loop or blade as possible be buried in the tissue with as small a part of it as possible exposed to the fluid. This explains why the loops used in the McCarthy Electrotome for Trans-Urethral Prostatic Resection have the insulation brought down on the wire of the loop on each side as much as possible.

However, the cutting current of the Birtcher Surgical Unit is of such a refined nature that it will be found that cutting under water may be readily achieved with even a fair portion of the wire of the loop exposed to the water. One should, however, experiment in under-water cutting.

Procure an ordinary aluminum or tin pan, two or three inches deep. Place it on the Indifferent Electrode. Don't use a porcelain enamel pan, the enamel is an insulator. Place two or three inches of water in the pan, immerse a piece of beef.

Now place the quarter-inch diameter loop, furnished with the Surgical Set, in the handle. Be sure that the loop is inserted all the way up in the handle so that the shank of the loop is not exposed.

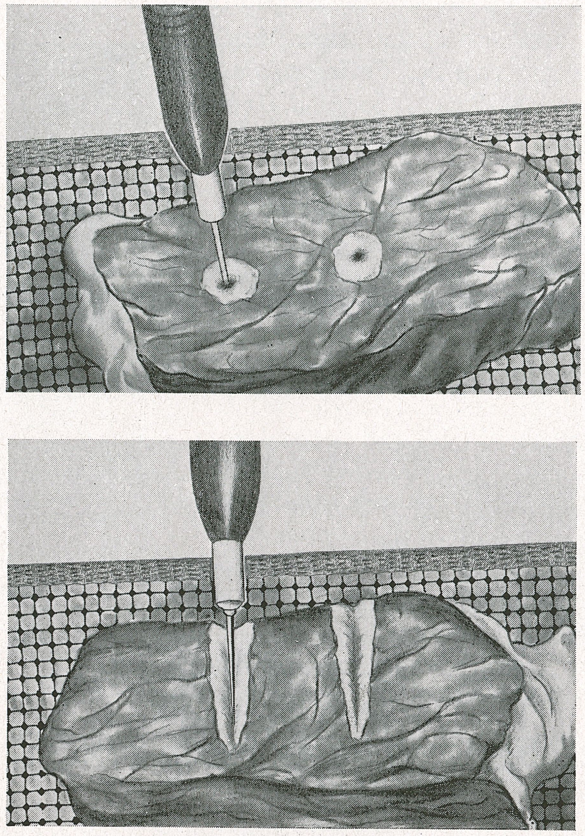


*Fig. 10—Illustrating Single Needle Electro-Coagulation*

Now place the left hand in the water against the meat, holding the meat snugly against the bottom of the pan to establish contact and to prevent the meat floating. Step on the footswitch and bring the operating loop in a vertical position downward. Hold the surgical handle like you would a pencil in writing. As the current bites in, push the loop downward in the tissue until its entire perimeter is buried within the tissue, then move the loop forward in a horizontal stroke. After a little practice, the downward and forward motion of the stroke will be coordinated as one motion.

After experimenting with the entire loop buried in the tissue for some time, gradually practice the same stroke with less and less of the loop in the tissue and more and more of it exposed to the water. The power Control Dial in under-water cutting should be set to higher relative positions, as indicated on the Dial.

Practice all of the foregoing with the spark-gap coagulating current also, and with the combined currents simultaneously.

Actually, the foregoing experiment, with the full-size un-insulated loop, is more difficult than with the shielded loop as used in Trans-Urethral Prostatic Resection.

In Trans-Urethral Prostatic Resection, loops with varying diameter of wire are used. The smaller the diameter of the wire, the more readily one cuts through tough tissue. With the Birtcher Surgical Unit, the operator will find that he readily cuts with any of the standard loops used with the McCarthy Electrotome. It will be a rare case indeed, in which it is necessary to use the smallest diameter loop (ten or twelve thousandths diameter), although the smaller wire loop is recommended for excessively fibrous tissue.

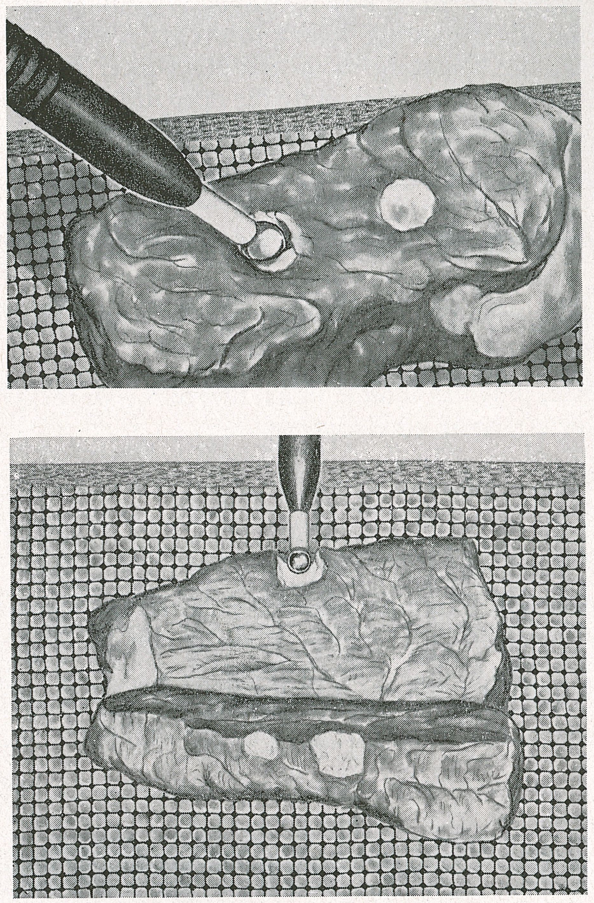


*Fig. 11—Illustrating Ball Point Electro-Coagulation*

It will furthermore be found that due to the true undamped nature of the cutting current of the Birtcher Surgical Unit, such a relatively small quantity of current is used that it is not necessary to have the expensive McCarthy Loops especially insulated, and they will give longer life.

## ELECTRO-COAGULATION

One should also experiment on the meat with Electro-Coagulation using the left pedal of the footswitch and the spark-gap current in conjunction with needle points, ball points, and blades. See Figures 10 and 11.

## THE ANESTHETIC

Since electro-surgery requires the presence of a spark in the operating field, the selection of the anesthetic is important. Care must be used to avoid the possibility of accidental explosion of the highly volatile anesthetic gases. NEVER USE ETHYLENE AS THE ANESTHETIC WITH ELECTRO-SURGERY, IT IS HIGHLY EXPLOSIVE IN VERY SMALL CONCENTRATIONS.

ETHER: Whereas ether explodes in relatively heavy concentrations so many electro-surgery operations have been performed in its presence without difficulty, that it seems reasonable to assume that its use is safe providing precautions are used. Keep the anesthetist shielded from the operating field with drapes. Be sure there is plenty of continuous ventilation in the operating room. Avoid spillage. Remove empty ether cans. Administer ether through a mask and not by the open drop. Do not use ether when operating field has communication with the respiratory passages.

## SPECIAL FEATURES OF THE BIRTCHER SURGICAL UNIT

1. Color-code guide, with panel markings, pilot lights and 3-pedal footswitch color-matched for instant selection of desired current.
2. Tone-Code guide, provides audible signal that tells your ears which current is "on" when your eyes are occupied elsewhere.
3. Calibrated range control suggests correct settings for each intensity of each separate current, according to the operation at hand.
4. Footswitch color-matched with pilot lights and operating panel calibrations.
5. Three active outlets for multiple connection of several types of instruments at one time.
6. Adjustable electrode holders keeps connected instruments within easy reach.
7. Sterilizable hand controls may be boiled or autoclaved.
8. Your favorite Electro-Surgical instruments may be used with the Birtcher-Built Surgical Unit.
9. Pre-heated tube filaments permit instant cutting without drag.
10. Advanced engineering technique provides smooth cutting, without blocking, even though tissue is contacted before current is turned on.
11. Two CV11 power tubes activated by separate filament and plate transformers provide a true undamped current for cutting.
12. Four gap, 8 tungsten point, air-cooled spark-gap assembly for production of true damped and "Oudin" currents.
13. Full cast aluminum operating panel with moulded bakelite switch knobs.
14. All-steel, cadmium-plated chassis rigidly mounted beneath operating panel making the entire assemblage easily removed from case for inspection and adjustment.
15. "Floating Power" tube assembly permits of safe transportation with tubes installed. Cushioned with spring steel.
16. Keratol-covered portable model has a convenient accessory compartment in its removable lid. Entire case can be locked with key provided.

17. Model plastic "no glare" pilot lights, color-matched with footswitch and operating controls, instantly signal which circuit is "on."
18. 3-Pedal, massive cast aluminum footswitch, provides positive and instant toe-tip control.
19. Available as a portable or as a mobile hospital unit.
20. Provides mixed or blended spark-gap coagulation current with tube cutting current with intensity of each independently controlled. Brilliant cutting with controlled coagulation.

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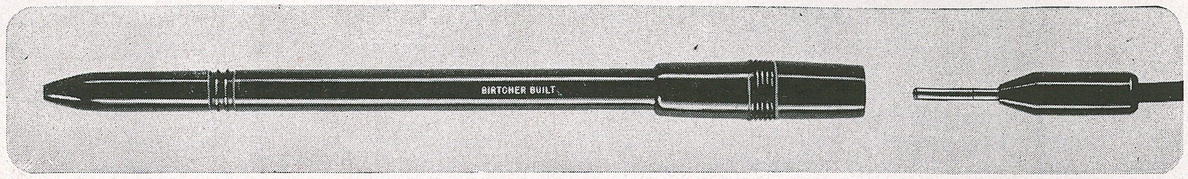

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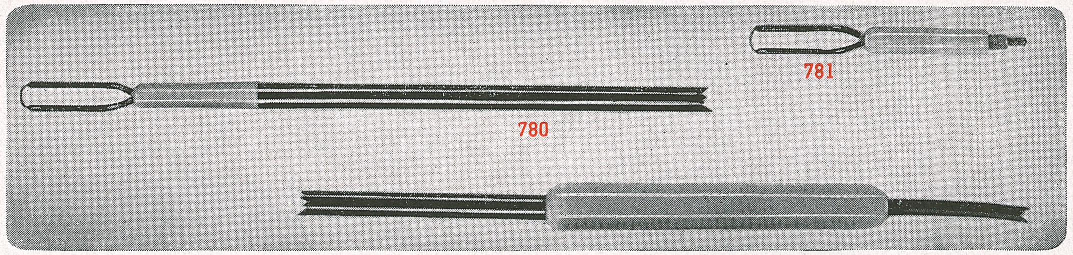

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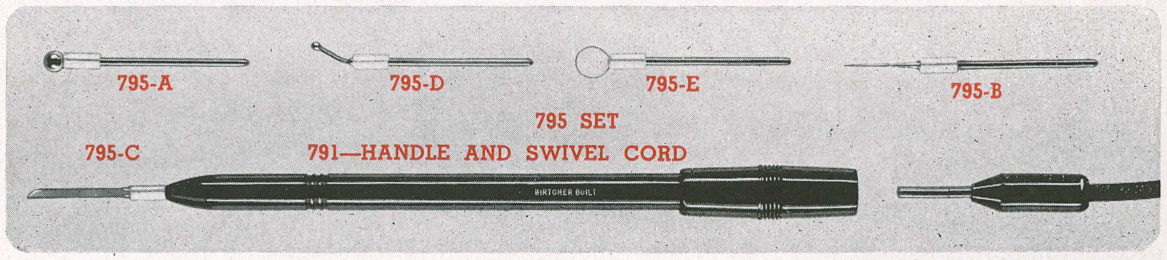

**795 SET** of five electrodes and boilable bakelite handle with swivel cord connection. (Illustrated above) **$9.50**

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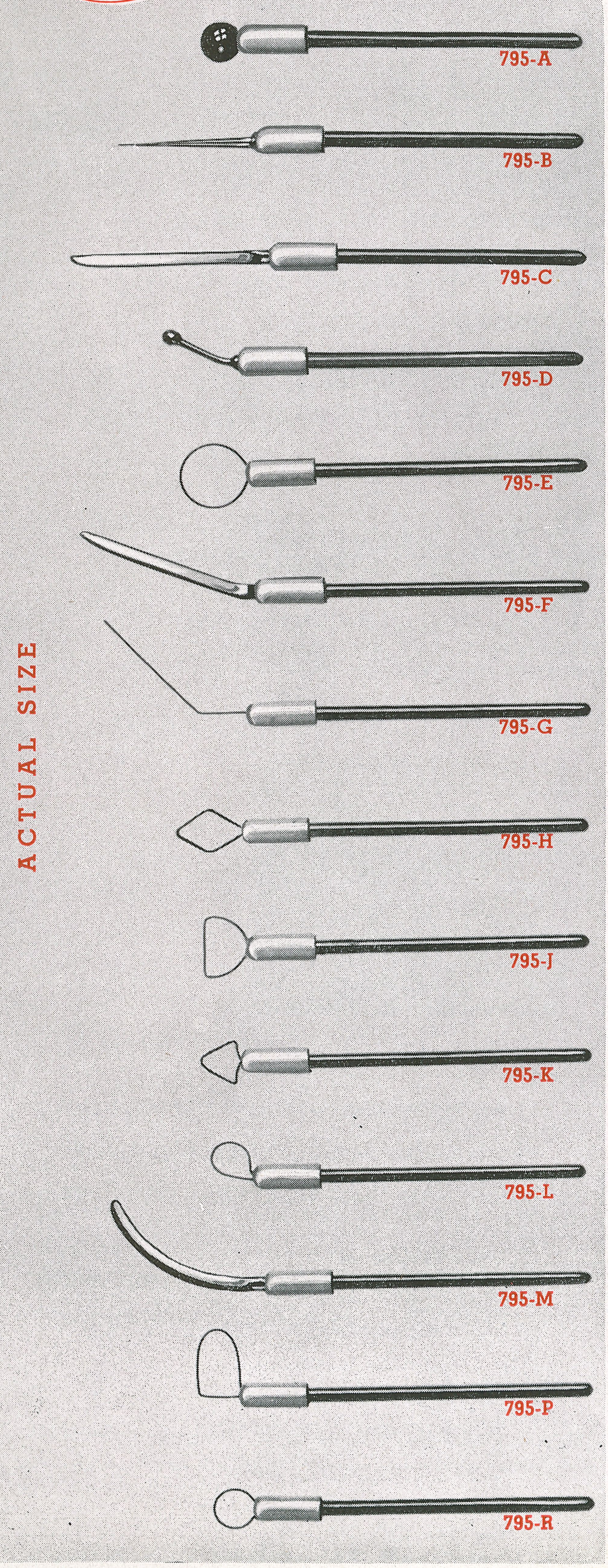

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**SKIN INCISION BLADE.** For fast initial skin incision with cutting current only, to assure primary union. Also cutting fat and vascular muscle tissue using high coagulation with cutting current. Price **$1.50.**

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**CUTTING LOOP.** 3/8″ diameter. For biopsy or cutting with scooping action. Will cut tissue to same shape and size. Adapted to delicate dissection with more or less of a knife and fork technique. Recommended for brain and in rectal surgery, and in the removal of malignant growths. Price **$1.50.**

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**30-DEGREE ANGLE BLADE.** For all purposes as No. 795-C but maintains a right angle to plane surface and is better for initial incision through skin, as in breast amputation. Price **$1.50.**

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**BOX-SHAPED CUTTING LOOP.** For biopsy or cutting with scooping action. Cuts tissue to same shape and size. Adapted to delicate dissection with more or less of a knife and fork technique. Excellent in brain and in rectal surgery, and in removal of malignant growths. Price **$1.50.**

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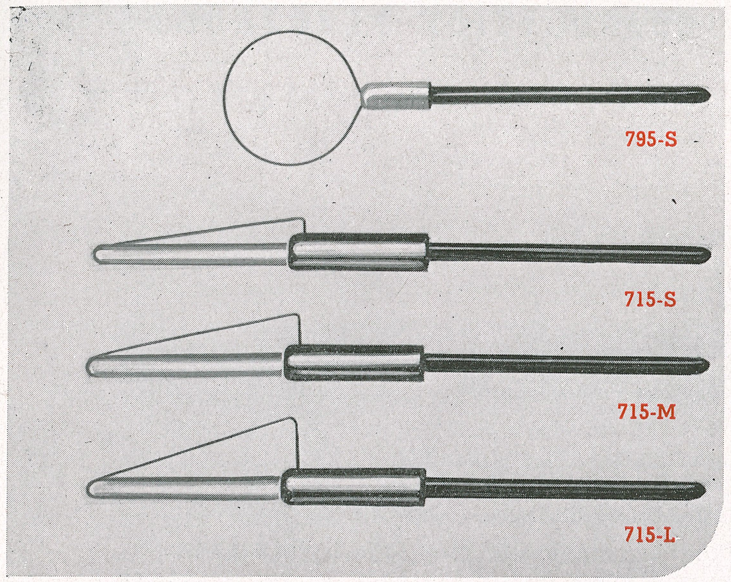

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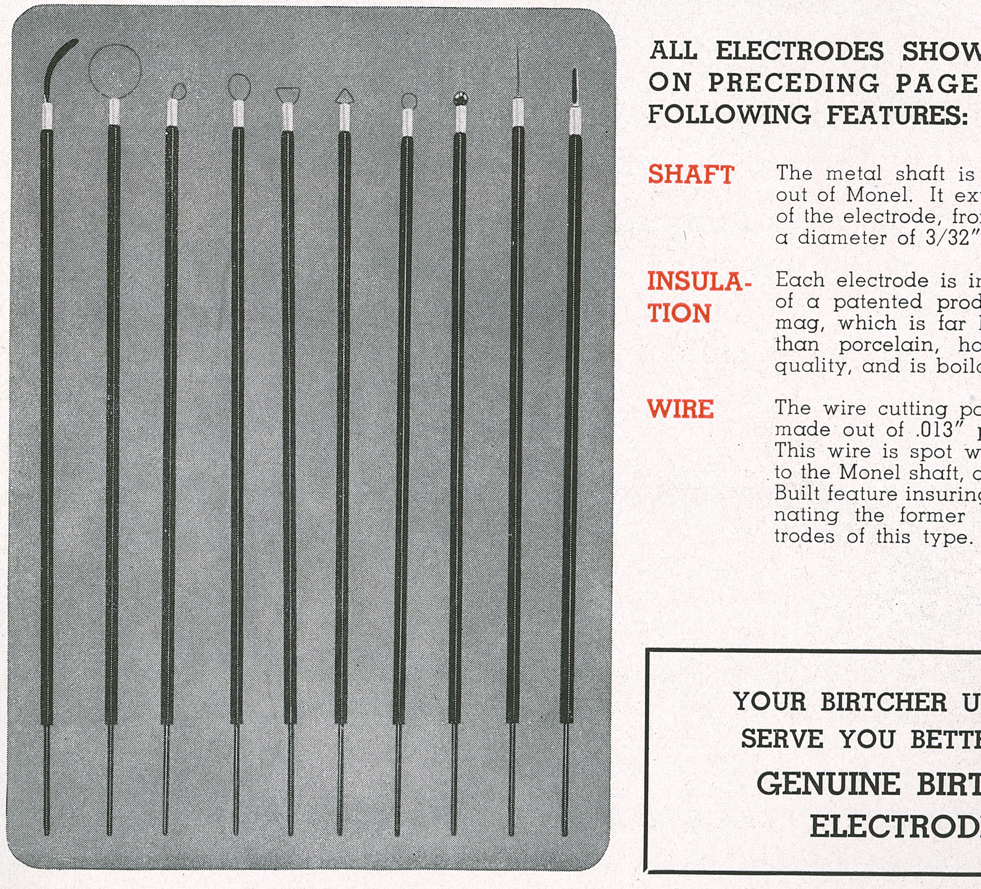

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**SHAFT** The metal shaft is precision machined out of Monel. It extends the full length of the electrode, from tip to tip, and has a diameter of 3/32″ (2.4 mm).

**INSULATION** Each electrode is insulated by a collar of a patented product known as Alsimag, which is far harder and stronger than porcelain, has higher dielectric quality, and is boilable.

**WIRE** The wire cutting portion of the loops is made out of .013″ pure Tungsten wire. This wire is spot welded, not soldered, to the Monel shaft, a distinctive Birtcher-Built feature insuring long life and eliminating the former weak spot in electrodes of this type.

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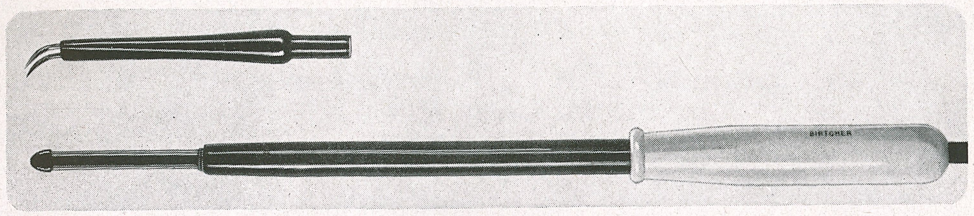
SERVE YOU BETTER WITH
**GENUINE BIRTCHER**
**ELECTRODES**

# BI-ACTIVE COAGULATION ELECTRODES



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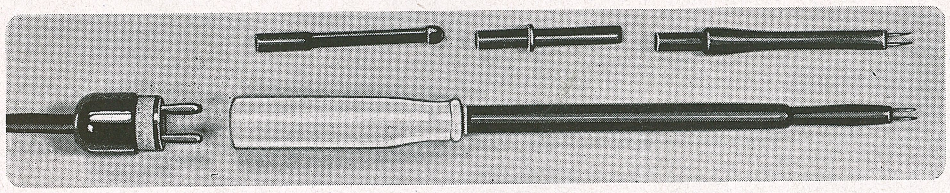

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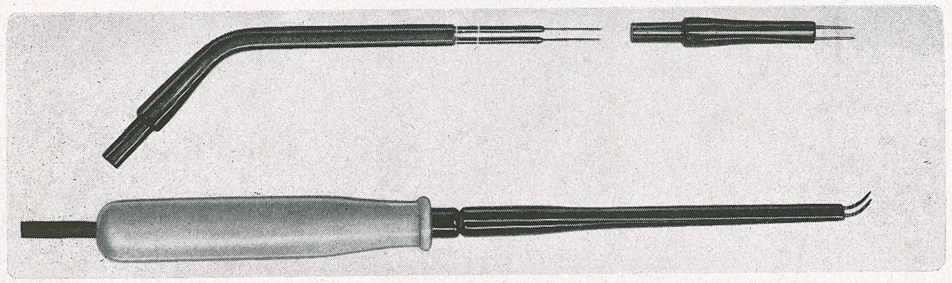

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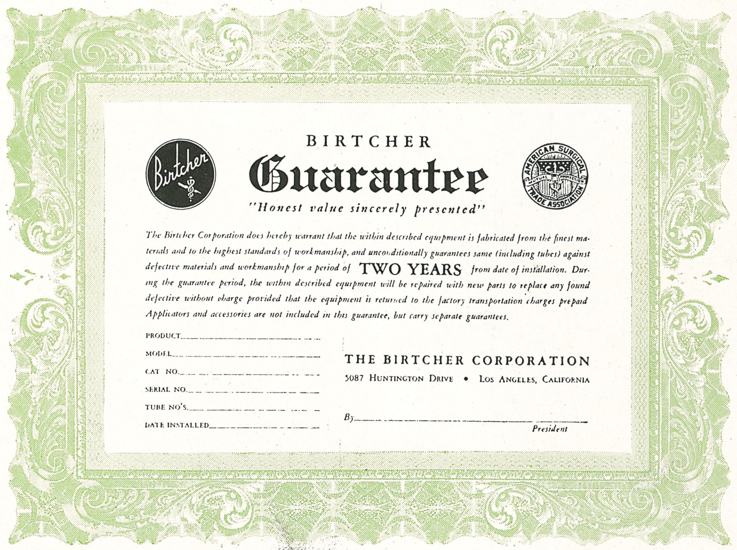

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*"Honest value sincerely presented"*

AMERICAN SURGICAL TRADE ASSOCIATION
MUTUAL PROTECTION

*The Birtcher Corporation does hereby warrant that the within described equipment is fabricated from the finest materials and to the highest standards of workmanship, and unconditionally guarantees same (including tubes) against defective materials and workmanship for a period of* TWO YEARS *from date of installation. During the guarantee period, the within described equipment will be repaired with new parts to replace any found defective without charge provided that the equipment is returned to the factory transportation charges prepaid Applicators and accessories are not included in this guarantee, but carry separate guarantees.*

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MODEL____________________
CAT NO.____________________
SERIAL NO.____________________
TUBE NO'S.____________________
DATE INSTALLED____________________

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*By*____________________________
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